The Association Between Malnutrition and Constipation in Elderly Individuals: A Cross-Sectional Analysis

Yaşlı Bireylerde Yetersiz Beslenme ve Kabızlık Arasındaki İlişki: Kesitsel Bir Analiz

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Abstract

This study aimed to examine the association between malnutrition and constipation in elderly individuals and to explore how nutritional status influences constipation risk, severity, and quality of life. Materials and Methods: A total of 358 community-dwelling individuals aged ≥65 years participated voluntarily. Nutritional status was assessed using the Mini Nutritional Assessment–Short Form (MNA-SF), and constipation was evaluated using the Constipation Risk Assessment Scale (CRAS), Patient Assessment of Constipation Quality of Life Questionnaire (PAC-QOL), and the Constipation Severity Instrument (CSI). Anthropometric measurements and 1-day dietary intake records were collected through face-to-face interviews. Data were analyzed using SPSS version 20. Results: Energy, macronutrient (protein, carbohydrate, fat), and dietary fiber intake significantly differed by nutritional status (p<0.05). Participants with malnutrition had higher constipation risk scores, more severe symptoms, and worse constipation-related quality of life (all p<0.001). A strong positive correlation was observed between MNA-SF scores and fiber intake (r=0.751, p<0.001).Conclusions: Malnutrition and constipation are closely interrelated in the elderly. Poor nutritional status, especially inadequate fiber and energy intake, is associated with increased constipation burden and lower quality of life. Early identification of malnutrition and implementation of tailored dietary interventions may improve gastrointestinal health and support healthy aging.

Keywords: Constipation, Elderly, Malnutrition, Nutritional Assessment

Öz

Bu çalışma, yaşlı bireylerde yetersiz beslenme ile kabızlık arasındaki ilişkiyi incelemek amacıyla yapılmıştır. Toplam 358 adet 65 yaş ve üzeri birey gönüllü olarak çalışmaya katılmıştır. Beslenme durumu Mini Beslenme Değerlendirmesi-Kısa Form (MNA-SF) ile kabızlık Kabızlık Risk Değerlendirme Ölçeği (CRAS), Hasta Kabızlık Yaşam Kalitesi Değerlendirme Anketi (PAC-QOL) ve Kabızlık Şiddeti Aracı (CSI) kullanılarak değerlendirildi. Antropometrik ölçümler ve 1 günlük besin tüketim kayıtları yüz yüze görüşme ile toplandı. Veriler SPSS 20. sürüm kullanılarak analiz edildi. Sonuçlar: Enerji, makrobesin (protein, karbonhidrat, yağ) ve diyet lifi alımı beslenme durumuna göre farklılık gösterdi (p<0,05). Yetersiz beslenen katılımcılar daha yüksek kabızlık risk skorlarına, daha şiddetli semptomlara ve kabızlıkla ilişkili daha kötü yaşam kalitesine sahipti (tümü p<0,001). MNA-SF skorları ile lif alımı arasında güçlü bir ilişki gözlendi (r=0,751, p<0,001). Yetersiz beslenme ve kabızlık yaşlılarda yakından ilişkilidir. Yetersiz beslenme, yetersiz lif ve enerji alımı, kabızlık yükünün artması ve yaşam kalitesinin düşmesi ile ilişkilidir. Malnütrisyonda kişiye özel diyet gastrointestinal sağlığı iyileştirebilir ve sağlıklı yaşlanmayı destekleyebilir.

Anahtar Kelimeler: Beslenme durumu, Konstipasyon, Malnütrisyon, Yaşlı bireyler

1.Introduction

Globally, the population is aging, and life expectancy is increasing (Chang et al., 2019; Crimmins & Zhang, 2019). According to the World Health Organization (WHO), individuals aged 65 and older are defined as "elderly", and this group is further categorized into "young old" (65–74 years), "advanced old" (75–84 years), and "very old elderly" (≥85 years) (Ho & Hendi, 2018). The share of people aged 60 years and over is projected to increase from 1 billion in 2020 to 2.1 billion by 2050, accounting for nearly 22% of the global population (GBD 2019 Ageing Collaborators, 2022). Türkiye has also experienced rapid demographic aging, with the elderly population expected to increase by over 200% between 2008 and 2040 (Navaneetham & Arunachalam, 2023).

Aging is accompanied by metabolic, physiological, and immunological changes that predispose individuals to both malnutrition and gastrointestinal disorders such as constipation (Ayilavarapu et al., 2016). Constipation is one of the most common complaints among older adults and is associated with decreased intestinal motility, physical inactivity, polypharmacy, and inadequate dietary fiber and fluid intake (Lim et al., 2021; Jeong et al., 2021). It can cause physical discomfort, psychological distress, and a decline in quality of life (Deb et al., 2020). Symptoms include hard stools, straining, infrequent bowel movements, abdominal bloating, and pain, and may lead to complications such as hemorrhoids, anal fissures, and fecal impaction requiring hospitalization (Mari et al., 2020).

Malnutrition is another major public health concern in the elderly and is characterized by inadequate intake of energy, protein, and micronutrients, often resulting from decreased appetite, comorbidities, or functional limitations (Pazhani et al., 2022). Poor nutritional status can worsen bowel function by reducing fiber intake and weakening the muscles involved in defecation (Goldberg & Jhurani, 2021). Conversely, chronic constipation can impair nutrient absorption and lead to reduced food intake, perpetuating a vicious cycle of malnutrition and gastrointestinal symptoms (Scarpignato & Bjarnason, 2019; Goriacko & Veltri, 2021).

Although both constipation and malnutrition are frequently encountered in geriatric practice, limited studies have explored their interrelationship in a comprehensive, quantitative manner (Yurtdaş Depboylu et al., 2023). Addressing this gap is essential for improving overall health and quality of life in aging populations (Rubenstein et al., 2023).

Therefore, the aim of this study was to investigate the association between nutritional status and constipation risk, severity, and quality of life in elderly individuals. Using validated assessment tools and dietary intake analysis, we sought to identify the nutritional determinants that may influence bowel health in older adults.

2.Materials and Methods

Study Design and Participants

This cross-sectional study included 358 community-dwelling individuals aged 65 years and older who participated voluntarily. The sample size was calculated using the G*Power program (version 3.1.9.2), based on an effect size of 0.3, a power of 0.95, and an alpha level of 0.05 for ANOVA comparisons. Ethical approval was obtained from the Gazi University Ethics Committee (approval code: 2018-202), and the study adhered to the principles of the Declaration of Helsinki. Participants with diagnosed inflammatory bowel disease or who were unwilling to participate were excluded. Data were collected through structured, face-to-face interviews conducted by trained researchers to minimize interviewer bias and improve data reliability.

Sociodemographic and Lifestyle Data

Data on sociodemographic characteristics—including age, sex, education level—and sleep duration (daytime and nighttime, in minutes) were collected using standardized questionnaires.

Anthropometric Measurements

Height (cm) was measured using a portable stadiometer, with participants standing barefoot in the Frankfort plane (Martin-Brief et al., 2021). Weight (kg) was measured using a calibrated electronic scale (Medical Scale DR-Mod 85). Waist circumference was measured midway between the lowest rib and the iliac crest. Neck circumference (NC) was measured at the midpoint of the neck, just below the laryngeal prominence, with participants in an upright position (Preis et al., 2020). Obesity risk was defined as NC ≥37 cm for men and ≥34 cm for women. Body Mass Index (BMI) was calculated as weight (kg) divided by height squared (m^2) and categorized according to WHO criteria: underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥30.0).

Dietary Intake Assessment

A 24-hour dietary recall was obtained from each participant to assess one-day food and nutrient intake (Subar et al., 2020). Intake of energy, macronutrients (carbohydrates, protein, fat), cholesterol, water, and total dietary fiber (soluble and insoluble) was calculated using the Nutrition Information System (BEBIS-7, full version), supported by a validated national food photograph catalog (Arab et al., 2021).

Nutritional Status Assessment

Nutritional status was evaluated using the Mini Nutritional Assessment-Short Form (MNA-SF), a validated and widely used screening tool for detecting malnutrition in older adults (Kaiser et al., 2021; Zhang et al., 2022). The MNA-SF includes six items assessing appetite loss, recent weight loss, mobility, psychological stress, neuropsychological problems, and BMI or calf circumference. Total scores range from 0 to 14 and are categorized as follows: 0–7 = malnourished, 8–11 = at risk of malnutrition, and 12–14 = normal nutritional status (24). The Turkish version of the MNA-SF has shown high internal consistency (Cronbach's alpha >0.80).

Constipation Assessment

Constipation was evaluated using three validated tools:

Constipation Risk Assessment Scale (CRAS): CRAS contains 33 items with a maximum score of 60. Recent multicenter studies have confirmed its reliability in geriatric populations (Bharucha et al., 2020; Serra-Prat et al., 2021). Scores were interpreted as follows: 1-10 = low risk, 11-15 = moderate risk, and ≥16 = high risk.

Patient Assessment of Constipation Quality of Life (PAC-QOL): This 28-item, five-point Likert scale assesses the impact of constipation across four subdomains: physical discomfort, psychosocial discomfort, satisfaction, and anxiety (Marquis et al., 2005). Higher scores indicate a more negative impact on quality of life, as demonstrated in recent geriatric population studies (Bharucha et al., 2020; Lee et al., 2021).

Constipation Severity Instrument (CSI): Developed by Varma et al. (2008) and validated in Turkish by Kaya and Turan (2011), CSI includes 16 items grouped under three domains: obstructive defecation (0-28), colonic inertia (0-29), and pain (0-16). Recent studies have confirmed its reliability in geriatric populations (Rao et al., 2018; Mearin et al., 2020). Total scores range from 0 to 73, with higher scores indicating more severe constipation symptoms.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 20. Data normality was assessed using the Kolmogorov–Smirnov test. Since data were normally distributed, parametric tests were used. One-way ANOVA was applied to compare means across nutritional status groups. Pearson's correlation coefficient was used to examine associations between continuous variables. Chi-square tests were used to analyze categorical variables. A p-value of <0.05 was considered statistically significant. Results were expressed as mean ± standard deviation ($\bar{x} \pm \sigma$). Graphs were generated using GraphPad Prism version 8.0. Prior to applying parametric tests, the data were checked for normality of distribution using the Shapiro-Wilk test and for homogeneity of variances using Levene's test. A p-value of less than 0.05 was considered statistically significant for all analyses.

3.Results

Table 1 summarizes the general characteristics of the participants, stratified by nutritional status and sex. Among men participants, significant differences were observed in BMI, height, body weight, waist circumference, and neck circumference across nutritional groups (p<0.05). Similarly, in women participants, BMI, body weight, and waist circumference varied significantly according to nutritional status (p<0.05). While educational level was not significantly associated with nutritional status among men (p=0.926), a near-significant trend was observed among women (p=0.07).

Table 1. General Characteristics of Individuals According to Malnutrition Status.

	Men				Women			
	Malnourished (n=14)	Risk of malnutrition (n=67)	Normal nutritional (n=97)		Malnourished (n=16)	Risk of malnutrition n (n=76)	Normal nutritional (n=88)	
	(x̄ ±σ)	(x̄ ±σ)	(x̄ ±σ)	p	(x̄ ±σ)	(x̄ ±σ)	(x̄ ±σ)	p
Age (years)	73.6±6.8	75.1±7.9	72.9±6.9	0.19	73.1±8.0	72.07±6.1	70.8±5.7	0.25
BMI (kg/m^2)	21.7±3.9	24.7±4.5	28.6±4.7	**0.001**	25.4±3.4	29.5±6.5	31.2±5.8	**0.001**
Height (cm)	164.2±8.9	169.3±5.6	169.5±7.4	**0.03**	159.8±9.1	157.6±6.1	158.0±6.1	0.46
Weight (kg)	58.6±10.9	70.6±11.1	82.3±15.2	**0.001**	64.7±9.7	73.1±15.4	78.0±15.7	**0.003**
Waist circumference (cm)	85.5±11.2	93±11.6	104±13.3	**0.001**	94.0±14.3	99.9±14.0	103.5±16.1	**0.04**
Neck circumference (cm)	34.9±6.5	37.9±3.8	40.9±3.6	**0.001**	37.6±3.6	37.1±5.1	38.2±5.7	0.38
Education level (n)								
İlliterate	0	2	4		3	5	15	
Literate	1	9	7		4	10	13	
Primary school	8	27	47	0.926	6	30	39	**0.07**
Secondary school	1	7	6		1	17	5	
High school	2	12	17		2	10	14	
University	2	10	16		0	4	2	
Sleeping time (minutes)								
Night	405±94.4	437.7±94.9	453.7±99.4	0.21	410±95.6	470.0±101.6	470.4±101.5	**0.08**
Day	51.07±40.3	47.3±55.0	56.2±57.7	0.61	35.6±36.6	34.7±46.5	54.1±65.1	**0.07**

As presented in Table 2, dietary intake significantly differed across nutritional status categories for both sexes. Participants classified as malnourished exhibited significantly lower mean intakes of energy, carbohydrates, protein, fat, and both soluble and insoluble dietary fiber (all p<0.05). Notably, energy intake and total fiber consumption increased progressively with improved nutritional status. No significant differences were detected in daily water intake among the groups (p>0.05).

Table 2. Nutritional Patterns of Individuals According to Malnutrition Status.

	Men				Women			
	Malnourished (n=14) (x̄ ±σ)	Risk of malnutrition (n=67) (x̄ ±σ)	Normal nutrition (n=97) (x̄ ±σ)	p	Malnourished (n=16) (x̄ ±σ)	Risk of malnutrition (n=76) (x̄ ±σ)	Normal nutrition (n=88) (x̄ ±σ)	p
Energy (kcal/day)	1581.9±207	1602.1±233	1830.9±23	**0.007**	1337.9±282	1491.7±284	1710.3±389	**0.01**
CHO (% energy/day)	46.2±9.0	48.1±6.9	50.0±8.9	**0.03**	47.7±7.4	46.9±8.2	48.2±7.8	0.44
CHO (g)	188.7±23.3	188.9±38.6	220.6±48	**0.001**	156.4±51.9	170.1±56.3	199.9±61.2	**0.01**
Protein (% energy/day)	15.2±2.0	17.3±3.5	16.0±3.5	**0.02**	16.0±2.0	17.3±4.4	16.8±3.9	0.31
Protein (g)	60.4±10.4	68.2±15.3	75.6±13.2	**0.02**	51.6±13.8	63.1±13.9	70.5±17.7	**0.01**
Fat (% energy/day)	35.7±5.2	35.1±7.1	33.4±7.3	0.24	36.2±7.1	35.3±7.9	34.6±7.1	0.49
Fat (g)	63.8±14.3	64.0±12.1	69.3±15.8	0.33	53.9±17.6	59.3±21.1	66.6±19.3	**0.02**
Cholesterol (mg)	299.9±127.9	292.2±194	308.1±174	0.87	255.5±122.2	256.3±132.6	311.2±183.4	**0.03**
Soluble fiber (g/day)	6.0±1.4	6.6±3.0	7.8±4.1	**0.04**	5.2±2.1	6.7±3.7	7.7±3.7	**0.01**
Insoluble fiber (g/day)	14.2±2.3	14.9±5.4	17.2±7.2	**0.04**	11.9±5.3	13.2±6.5	15.2±6.8	**0.01**
Total fiber (g/day)	19.9±2.5	20.9±7.8	25.9±11.2	**0.008**	17.1±6.8	20.1±9.4	23.1±9.8	**0.01**
Water (g)	1474.5±448	1375.5±538	1433.9±49	0.70	1367±382.5	1432.6±485	1300.5±443	0.24

Table 3 displays the relationship between nutritional status and constipation-related measures. Malnourished individuals had significantly higher mean scores on the CRAS, CSI, and PAC-QOL compared to participants with normal nutritional status ($p<0.001$ for all). These findings suggest that poor nutritional status is strongly associated.

Table 3. Constipation Scale Scores According to Malnutrition Status.

	MNA Status			
	Malnourished (n=30) (x̄ ±σ)	Risk of malnutrition (n=143) (x̄ ±σ)	Normal nutritional (n=185) (x̄ ±σ)	p
Constipation Risk Assessment Scale (CRAS)	15.3±6.9	12.6±5.7	9.5±4.5	**0.001**
The Patient Assessment of Constipation Quality of Life Scale (PAC-QOLQ)	76.7±19.5	65.3±18.1	57.1±15.5	**0.001**
The Constipation Severity Instrument (CSI)	15.3±6.9	12.6±5.7	9.5±4.5	**0.001**

Figure 1 illustrates average sleep duration by nutritional status. A statistically significant difference was identified across the groups (p<0.05), with malnourished participants reporting shorter overall sleep duration compared to those with normal nutritional status.

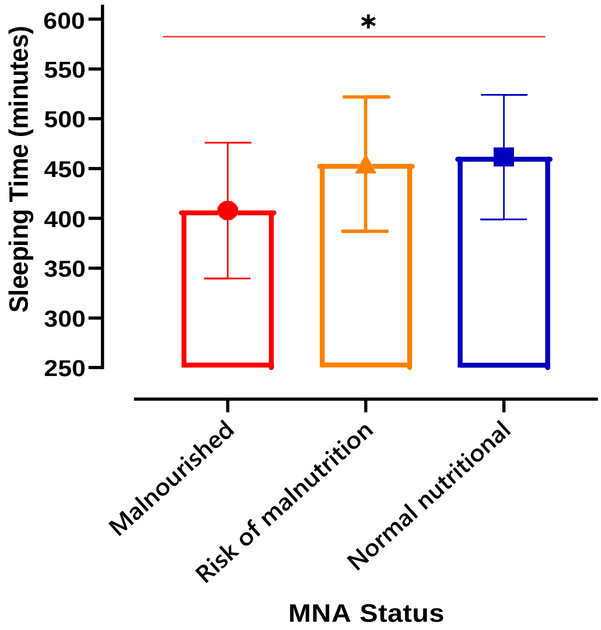

Figure 1. The relationship between the average sleep duration of individuals and their nutritional status

Figure 2 depicts the correlation between MNA-SF scores and daily fiber intake. A strong, positive correlation was found (r = 0.751, p<0.001), indicating that higher fiber intake is closely associated with improved nutritional status.

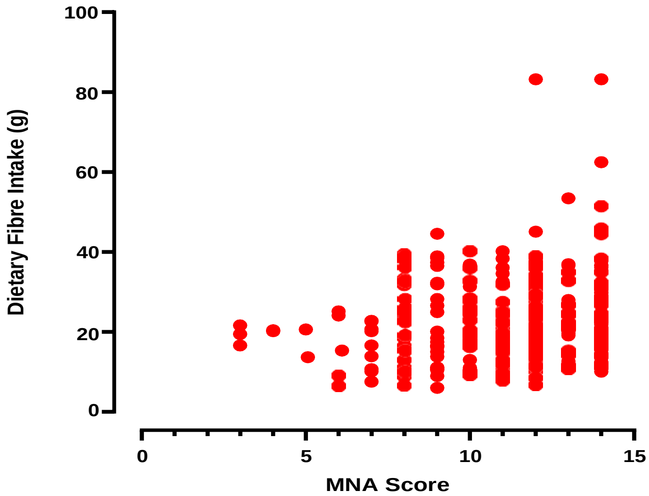

Figure 2. Relationship between individuals' MNA scores and their average fiber intake

4.Discussion

Malnutrition is a prevalent condition among older adults, increasing in frequency with advancing age due to metabolic, physiological, and immunological changes that occur during the aging process (Mao et al., 2023; Sucuoglu Isleyen et al., 2023). In this study, malnutrition was identified in 14 out of 178 elderly men (mean age: 73.6±6.8 years) and 16 out of 180 elderly women (mean age: 73.1±8.0 years). Additionally, 67 men (75.1±7.9 years) and 76 women (72.1±6.1 years) were classified as being at risk of malnutrition (Yurtdaş Depboylu et al., 2023; Jiesisibieke et al., 2023). Malnutrition negatively affects both the physical and emotional well-being of elderly individuals (Hung et al., 2023; Dericioglu et al., 2024).

Body Mass Index (BMI) is commonly used to evaluate nutritional status in older adults (Liang et al., 2022). While a BMI of up to 27 kg/m² is generally considered normal for this population, our findings revealed significantly lower BMI values in malnourished participants (21.7±3.9 kg/m² in men; 25.4±3.4 kg/m² in women, $p<0.05$) (Liu et al., 2024). These results align with previous studies suggesting that a BMI below 22 kg/m² may indicate malnutrition risk in older adults (Al-Jawaldeh et al., 2023; Yang et al., 2022). Maintaining an appropriate BMI is essential for preserving health and functional capacity in later life (Wham & Miller, 2016).

Although some literature suggests an association between lower educational attainment and increased malnutrition risk, our study did not find a statistically significant relationship between educational level and malnutrition among either sex ($p>0.05$). Nevertheless, limited nutritional knowledge and healthcare access in individuals with lower education may contribute to poor dietary practices (Johnson, 2021; Liu et al., 2022). Thus, education may serve as an indirect factor influencing nutritional outcomes.

Sleep duration is another factor that may influence quality of life in the elderly. Although our results did not demonstrate a significant association between sleep quality and malnutrition in either men (night sleep: $p=0.21$; daytime sleep: $p=0.61$) or women (night: $p=0.08$; daytime: $p=0.07$), previous studies have observed that malnourished individuals tend to exhibit longer and more frequent daytime sleep episodes, suggesting possible fatigue or reduced vitality (Yang et al., 2022; Liang et al., 2024).

Reduced energy intake is common in older adults, often due to declines in basal metabolic rate (BMR) and physical activity (Barkoukis, 2016). BMR decreases by approximately 1–2% per decade, primarily due to reductions in lean body mass and increases in adiposity (Clegg et al., 2024). Aging is also associated with a more sedentary lifestyle, contributing to further decreases in energy expenditure (Sucuoglu Isleyen et al., 2023). National guidelines recommend daily energy intakes of 28 kcal/kg for men and 27 kcal/kg for women aged ≥65 (Champakamala, 2022). Diets rich in vegetables, fruits, and whole grains—such as the Mediterranean diet—are encouraged to support longevity and functional independence (Dąbek et al., 2023).

Our findings showed a significant association between low energy and fiber intake and malnutrition status in both sexes (Yurtdaş Depboylu et al., 2023). Among men, energy ($p=0.007$), carbohydrate ($p=0.03$), protein ($p=0.02$), and fiber ($p=0.008$) intake were significantly associated with malnutrition, whereas fat, cholesterol, and water intake were not. Among women, energy ($p=0.001$), cholesterol ($p=0.03$), and fiber ($p=0.001$) intake showed significant associations (Jiesisibieke et al., 2023; Liu et al., 2022). These findings are consistent with previous research indicating that protein-energy malnutrition and deficiencies in essential micronutrients such as zinc, selenium, and vitamin B6 contribute to immune dysfunction and general health decline in older adults (Dericioglu et al., 2024; Kuo et al., 2023).

Constipation is another prevalent concern among the elderly, affecting both physical and emotional well-being and significantly reducing quality of life (Yang et al., 2022; Liang et al., 2022). Our study found a significant association between malnutrition and constipation ($p<0.05$), as well as between constipation and impaired quality of life ($p=0.001$). These findings support existing literature indicating that poor nutritional status increases the likelihood of constipation (Depboylu et al., 2023; Liu et al., 2024). Conversely, chronic constipation may also impair nutrient intake and absorption, forming a vicious cycle (Hung et al., 2023).

Overall, our results emphasize the importance of integrated nutritional and gastrointestinal management strategies in geriatric care. Early identification of malnutrition and interventions such as dietary fiber optimization may alleviate constipation symptoms and improve life quality among older individuals (Barkoukis, 2016; Kuo et al., 2023).

Limitations

One of the main limitations of this study is that the dietary assessment was based on a single 24-hour dietary recall. A single-day record may not fully capture the day-to-day intra-individual variation in dietary intake and thus may not be representative of the participants' usual diet. Future studies employing multiple-day records or food frequency questionnaires are warranted to overcome this limitation.

5.Conclusions

Improving dietary quality by ensuring adequate intake of macronutrients, fiber, and fluids may help prevent malnutrition and alleviate constipation in elderly populations. Malnutrition is a significant public health concern associated with reduced independence, diminished quality of life, increased hospitalization, and greater risk of complications such as infections, delayed wound healing, and mortality. This study found a strong association between malnutrition and constipation, and between constipation and reduced quality of life. Greater awareness, early diagnosis, and the development of targeted bowel management and nutritional interventions are recommended to promote healthy aging. It is important to emphasize that due to the cross-sectional design of the study, the findings represent associations and cannot be interpreted as causal relationships. To elucidate the potential causal nature of these observed associations, longitudinal studies, such as prospective cohort or intervention studies, arerequired.

Authors' contributions

N.A.T., H.B., and M.T. contributed to idea conception, design, data collection, analysis, and interpretation. N.A.T., H.B., and M.T. contributed to manuscript drafting and manuscript revision. N.A.T., H.B., and M.T. supervised the study and revised the final manuscript. All authors approved the final manuscript.

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Availability of data and materials

The dataset generated and analyzed during the current study is available from the corresponding author upon reasonable request.

Ethics and consent to participate

This study was performed following the Declaration of Helsinki. Approval for the study was obtained from the Gazi University Ethics Commission with the study code no:2018-202 on 08.05.2018.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Conflict of interest

All authors declare that they have no competing interes

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